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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/123,352	07/28/1998	YUNLONG LI	100869	5448

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EXAMINER	
ZERVIGON, RUDY	
ART UNIT	PAPER NUMBER
1763	20

DATE MAILED: 01/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/123,352	LI ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 December 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *22-37 and 41-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *22-37 and 41-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Prosecution Application / Continued Examination Under 37 CFR 1.114

1. The request for a continued prosecution application (CPA) under 37 CFR 1.53(d) filed on February 6, 2002 is acknowledged. 37 CFR 1.53(d)(1) was amended to provide that the prior application of a CPA must be: (1) a utility or plant application that was filed under 35 U.S.C. 111(a) before May 29, 2000, (2) a design application, or (3) the national stage of an international application that was filed under 35 U.S.C. 363 before May 29, 2000. *See Changes to Application Examination and Provisional Application Practice*, interim rule, 65 *Fed. Reg.* 14865, 14872 (Mar. 20, 2000), 1233 *Off. Gaz. Pat. Office* 47, 52 (Apr. 11, 2000). Since a CPA of this application is not permitted under 37 CFR 1.53(d)(1), the improper request for a CPA is being treated as a request for continued examination of this application under 37 CFR 1.114. *See id.* at 14866, 1233 *Off. Gaz. Pat. Office* at 48.

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 7, December 18, and December 24, 2002 has been entered.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 24 states "said second magnetic force line generating portion is fashioned so as to be input said". Claim 24 is grammatically flawed rendering the claim indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 25 states "The first magnetic force line generating portion comprises a magnet (N magnet of 401), and is fashioned so that a N (north) pole of the magnet faces the plasma generation region and a straight line connecting a N pole and a S pole of the magnet intersects the center axis of the discharge electrode about at a right angle...". However, it is unclear if the "straight line" connecting a N pole and a S pole of the magnet is a magnetic force line. In the body of the rejections below, the "straight line" connecting a N pole and a S pole of the magnet is the geometric line where magnetic field lines meet by divergence or convergence (cusp) and thus intersects the center axis of the discharge electrode at a right angle.

6. Claims 26-34 recites the limitation "said two walls". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 22-26, 37, and 41-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato et al[1] (JP07-201831). Sato teaches a plasma generation apparatus (abstract; all Figures), comprising:

i. A vacuum vessel (abstract, Purpose, item 1; All Figures) having a plasma generation region established in an interior thereof (section [0001] of computer translation);

ii. A gas inductor (8, Figure 4; [0030]) that inducts discharge gas into the interior of the vacuum vessel

iii. An exhaust (7, Figure 4; [0030]) that exhausts an atmosphere in the interior of the vacuum vessel

iv. A tube shaped discharge electrode (9, Figure 4; [0045]) fashioned so as to enclose the plasma generation region;

v. A first high-frequency electric power applicator (19, Figure 4; [0045]) that applies first high-frequency electric power to the discharge electrode;

vi. A first magnetic force line generating portion (first four magnets 401 to the left of center magnet 402, Figure 4; [0051]) fashioned so as to enclose the plasma generating region and

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[1] Computer Translation from
http://www6.ipdl.jpo.go.jp/Tokujitu/PAJdetail.ipdl?N0000=60&N0120=01&N2001=2&N3001=H07-201831

positioned near one end portion (left side) of the discharge electrode in the direction of a center axis of the discharge electrode (Figure 4);

vii. A second magnetic force line generating portion (last four magnets 401 to the right of center magnet 402, Figure 4; [0051]) fashioned so as to enclose the plasma generating region and positioned near the other end portion (right side) of the discharge electrode in the direction of a center axis of the discharge electrode (Figure 4);

viii. Two walls electrodes (each item 5, Figure 4; [0027]) positioned so as to sandwich the plasma generation region between them, in the direction of the center axis of the discharge electrode, for defining the scope of the plasma generation region in the direction of the center axis (Figure 4);

ix. The magnetic force line generating portion fashioned so as to generate magnetic force lines having portions roughly parallel to the center axis of the discharge electrode, such that the length of the parallel portions become longer the closer the magnetic force lines are to the center, the magnetic force lines capable of trapping electrons at least in a center of the plasma generation region and being shaped so that they do not intersect the two walls in the center of the plasma generation region – compare magnetic arrangement (42) of Applicant's Figures and Sato's magnetic arrangement (Figure 4). Additionally, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01). Figure 1 of Sato provides a teaching of the strength of the magnets as noted by the flux lines 501-503.

x. Portions of the first and second magnetic force line generating portions output and input magnetic force lines into and out of the plasma generating region. Refer to MPEP 2112.01 discussed above.

xi. The first magnetic force line generating portion comprises a magnet (N magnet of 401), and is fashioned so that a N (north) pole of the magnet faces the plasma generation region and a straight line connecting a N pole and a S pole of the magnet intersects the center axis of the discharge electrode about at a right angle - The "straight line" connecting a N pole and a S pole of the magnet is the geometric line (not shown) where magnetic field lines meet by divergence or convergence (cusp) and thus intersects the center axis of the discharge electrode at a right angle.

xii. The second magnetic force line generating portion comprises a magnet (S magnet of 401), and is fashioned so that a S (south) pole of the magnet faces the plasma generation region and a straight line connecting a N pole and a S pole of the magnet intersects the center axis of the discharge electrode about at a right angle

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 27-31, are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (JP07-201831) in view of Shamouilian et al (USPat. 6,095,084). Sato is discussed above. Sato does not teach a second high-frequency electric power applicator that applies second high-frequency electric power to one of the walls. Sato also does not teach the other of the two walls is connected to a reference potential or is floated.

Shamouilian teaches a similar plasma processing device (Figure 2). Additionally, Shamouilian teaches a first high-frequency electric power applicator ("power electrode"; Figure 2) that applies high-frequency electric power to the chuck (165, column 9, lines 1-10). Shamouilian also teaches the other of the two walls (145) is connected to a reference potential by a second high-frequency electric power applicator ("Primary bias electrode"; Figure 2) or is floated (column 10, lines 1-10).

It would have been obvious to one of ordinary skill in the art at the tine the invention was made to apply a second high-frequency electric power applicator that applies second high-frequency electric power to one of Sato's walls as taught by Shamouilian and where the other of the two walls is connected to a reference potential.

Motivation to apply a second high-frequency electric power applicator that applies second high-frequency electric power to one of Sato's walls as taught by Shamouilian and where the other of

the two walls is connected to a reference potential is to provide an alternate and equivalent means of generating a capacitevely coupled plasma (column 9, lines 15-20).

11. Claims 16, 32-34, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (JP07-201831) and Shamouilian et al (USPat. 6,095,084), in view of Koshimizu (USPat. 5,997,687). Sato and Shamouilian are discussed above. Sato and Shamouilian do not teach a high-frequency resonant circuit that provides a resonant frequency between the first and the second high-frequency electric power supply. Additionally, Sato and Shamouilian do not teach a controller that controls the magnitude of the first and second high-frequency electric power with a predetermined power ratio between the first and second high-frequency electric power supplies. Koshimizu teaches a similar diode plasma reactor (Figure 1) comprising a high-frequency resonant circuit (125, 132; column 5, lines 52-59; column 6, lines 5-13) that provides a resonant frequency ("resonance conditions") between a first (128) and a second (136) high-frequency electric power supply applied to two walls (112, 104) of which one (112) is a gas diffusion plate. Koshimizu further teaches a controller (129; Figure 1) that controls the magnitude of the first and second high-frequency electric power (column 5, lines 60-65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Koshimizu's high-frequency resonant circuit and controller between the two high-frequency sources of Sato and Shamouilian apparatus to control and set a predetermined power ratio between the first and second high-frequency electric power supplies.

Motivation to use Koshimizu's high-frequency resonant circuit between the two high-frequency sources of the Sato and Shamouilian apparatus is to control the plasma to ensure uniform processing and to protect the processed wafer from damage (column 6, lines 23-26). Motivation

for providing a constant power ratio between the high-frequency power sources is drawn to the optimization of the operation of the apparatus. Inclusive, it would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

12. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (JP07-201831) in view of Koshimizu (USPat. 5,980,687). Sato was discussed above. Sato does not teach a position adjuster that adjusts positions of the two walls in the center axis of the discharge electrode. Koshimizu (USPat. 5,980,687) teaches a similar diode plasma reactor (Figure 1) including a position adjuster ("driving mechanism" column 3, lines 49-61; column 4, lines 15-22) that adjusts positions of the two walls (116, 110).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Koshimizu's position adjuster to adjust the position of Sato's two walls.

Motivation to use Koshimizu's position adjuster that adjusts positions of Sato's two walls is to improve uniformity of the generated plasma as taught by Koshimizu.

13. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (JP07-201831). Sato is discussed above. Sato teaches more than two magnetic force line generating portions as discussed above.

It would have been obvious to one of ordinary skill in the art at the tine the invention was made to reduce the number of Sato's magnetic force line generating portions to provide only two magnetic force line generating portions.

Motivation to reduce the number of Sato's magnetic force line generating portions to only two magnetic force line generating portions is optimize the magnetic flux in the processing chamber. It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele , 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc . v. Biocraft Laboratories Inc. , 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied , 493 U.S. 975 (1989); In re Kulling , 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. USPat. 5,653,851; 5,656,123; 5,362,358.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after final fax phone number for the 1763 art unit is (703) 872-9311. The official before final fax phone number for the 1763 art unit is (703) 872-9310. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (703) 308-1633.

JEFFRIE R. LUND
PRIMARY EXAMINER